

IN THE SPECIFICATION

Please insert the following paragraph on page 1 after the title of the invention and before the "Technical Field":

--RELATED APPLICATION

This application is a national phase of PCT/JP2004/018222 filed on December 7, 2004, which claims priority from Japanese Application No. 2003-416192 filed on December 15, 2003, the disclosures of which Applications are incorporated by reference herein. The benefit of the filing and priority dates of the International and Japanese Applications is respectfully requested.--

The following paragraphs will replace all prior versions of them in the specification of the application.

- 1) Page 6, line 16 – Page 7, line 16, please delete:

~~In order to solve the above-mentioned problems, according to the present invention (Claim 1), there is provided an audio compression and decompression device, comprising: an adaptive differential pulse code modulation circuit which modulates digital audio data by an adaptive differential pulse code modulation system; and a high frequency component cutting unit which cuts off high frequency components existing on a high frequency band of the digital audio data before compression which are inputted to the adaptive differential pulse code modulation circuit.~~

~~According to the present invention (Claim 2), there is provided an audio compression and decompression device, comprising: an adaptive differential pulse code modulation circuit which modulates digital audio data by an adaptive differential pulse code modulation system; and a high frequency component cutting unit which cuts off high frequency components existing on a high frequency band of the digital audio data after decompressed which are outputted from the adaptive differential pulse code modulation circuit.~~

~~According to the present invention (Claim 3), in the audio compression and decompression device as defined in Claim 1 or 2, the high frequency component cutting unit is a low-pass filter.~~

~~According to the present invention (Claim 4), in the audio compression and decompression device as defined in Claim 2, the high frequency component cutting unit is a noise shaper.~~

2) Page 7, lines 17 - 19, please change:

~~A In order to solve the above-mentioned problems, according to the present invention (Claim 5), the audio compression and decompression device as defined in Claim 1 or 2 further includes: there is provided an audio compression and decompression device comprising: an adaptive differential pulse code modulation circuit which modulates digital audio data by an adaptive differential pulse code modulation system; a high frequency component cutting unit which cuts off high frequency components existing on a high-frequency band of the digital audio data before compression which are inputted to the adaptive differential pulse code modulation circuit, or the digital audio data after decompression which are outputted from the adaptive differential pulse code modulation circuit; and a controller which changes cutoff frequency characteristics of the high frequency component cutting unit according to a compression bit rate of the adaptive differential pulse code modulation circuit.~~

3) Page 7, line 23 – Page 9, line 13, please delete:

~~According to the present invention (Claim 6), the audio compression and decompression device as defined in Claim 1 further includes: a noise addition circuit which adds noise components which corresponds to high frequency components which have been cut off by the high frequency component cutting unit, to the digital audio data after decompressed which are outputted from the adaptive differential pulse code modulation circuit.~~

~~According to the present invention (Claim 7), the audio compression and decompression device as defined in Claim 6 includes: a controller which changes cutoff frequency characteristics of the high frequency component cutting unit, and at least one of the noise components, the frequency band to which the noise components are added, and the volume of the noises, according to a compression bit rate of the adaptive differential pulse code modulation circuit.~~

~~According to the present invention (Claim 8), in the audio compression and decompression device as defined in Claim 1 or 2, the high frequency components cutting unit is a low pass filter including: plural first delay circuits which delay input digital audio data; plural first multipliers which multiply the outputs from the plural first delay circuits by previously set coefficients, respectively; a first adder which adds the input digital audio data and the outputs from the plural first multipliers; a second multiplier which multiplies the output from the first adder by a previously set coefficient; plural second delay circuits which delay output digital audio data; plural third multipliers which multiply the outputs from the plural second delay circuits by previously set coefficients, respectively; a second adder which adds the output from the second multiplier and the outputs from the plural third multipliers; and a fourth multiplier which multiplies the output from the second adder by a previously set coefficient.~~

~~According to the present invention (Claim 9), the audio compression and decompression device as defined in Claim 8 wherein: there is provided a controller which changes cutoff frequency characteristics of the low pass filter according to a compression bit rate of the adaptive differential pulse code modulation circuit, and said controller changes the respective coefficients of the plural first multipliers and the respective coefficients of the plural third multipliers, for each multiplier.~~

4) Page 9, lines 14-16, please change:

~~According to the present invention (Claim 10), the audio compression and decompression device as defined in Claim 1 further includes: there is provided an audio compression and decompression device comprising: an adaptive differential pulse code modulation circuit which modulates digital audio data by an adaptive differential pulse code modulation system; a high frequency component cutting unit which cuts off high frequency components existing on a high-frequency band of the digital audio data before compression which are inputted to the adaptive differential pulse code modulation circuit; and an amplitude detection circuit which detects an amplitude in a high frequency region of the digital audio data before compressed which are inputted to the adaptive differential pulse code modulation circuit; and a controller which compares the amplitude detected by the amplitude detection circuit with a threshold value, and~~

changes the cutoff frequency characteristics of the high frequency component cutting unit on the basis of the comparison result.

5) Page 9, line 24 and Page 10, line 1, please delete:

According to the present invention (~~Claim 11~~), in the audio compression and decompression device ~~as defined in Claim 10~~, the controller changes the cutoff frequency characteristics of the high frequency component cutting unit when the amplitude detected by the amplitude detection circuit exceeds the threshold value.

6) Page 10, lines 5 and 7, please delete:

According to the present invention (~~Claim 12~~), in the audio compression and decompression device ~~as defined in Claim 10~~, the controller changes the cutoff frequency characteristics of the high frequency component cutting unit when the amplitude detected by the amplitude detection circuit has exceeded the threshold value during a previously set time period, or when amplitude detected by the amplitude detection circuit has not exceeded the threshold value during a previously set time period.

7) Page 10, line 15 – Page 11, line 21, please delete:

~~The audio compression and decompression device of the present invention comprises an adaptive differential pulse code modulation circuit which modulates digital audio data by an adaptive differential pulse code modulation system and a high frequency component cutting unit which cuts off high frequency components existing on a high frequency band of the digital audio data before compression which are inputted to the adaptive differential pulse code modulation circuit. Therefore, it is possible to reduce quantization noises on a high frequency band of decompressed digital audio data, which are generated due to that the compression ratio is increased when digital audio data are compressed or decompressed by the adaptive differential pulse code modulation system.~~

According to the present invention, there is provided an audio compression and decompression device, comprising an adaptive differential pulse code modulation circuit which modulates digital audio data by an adaptive differential pulse code modulation system, and a

~~high frequency component cutting unit which cuts off high frequency components existing on a high frequency band of the digital audio data after decompressed which are outputted from the adaptive differential pulse code modulation circuit. Therefore, it is possible to reduce quantization noises on a high frequency band of the decompressed audio data, which are generated due to that the compression ratio is increased when digital audio data are compressed or decompressed by the adaptive differential pulse code modulation system.~~

~~According to the present invention, in the audio compression and decompression device, the high frequency component cutting unit is a noise shaper. Therefore, it is possible to effectively remove quantization noises and reproduce digital audio data in a higher sound quality.~~

8) Page 11, lines 22-23, please change:

~~According to the present invention, the audio compression and decompression device includes The audio compression and decompression device of the present invention comprises an adaptive differential pulse code modulation circuit which modulates digital audio data by an adaptive differential pulse code modulation system, a high frequency component cutting unit which cuts off high frequency components existing on a high-frequency band of the digital audio data before compression which are inputted to the adaptive differential pulse code modulation circuit, or the digital audio data after decompression which are outputted from the adaptive differential pulse code modulation circuit, and a controller which changes cutoff frequency characteristics of the high frequency component cutting unit according to a compression bit rate of the adaptive differential pulse code modulation circuit.~~

9) Page 12, line 9 – Page 14, line 4, please delete:

~~According to the present invention, the audio compression and decompression device, further includes a noise addition circuit which adds noise components which corresponds to high frequency components which have been cut off by the high frequency component cutting unit, to the digital audio data after decompressed which are outputted from the adaptive differential pulse code modulation circuit. Therefore, it is possible to reproduce in a pseudo manner the high frequency components which have been suppressed by making the digital audio data before~~

~~compressed which are inputted to the adaptive differential pulse code modulation circuit, pass through the high frequency component cutting unit. Consequently, it is possible to eliminate unnaturalness of audio data at the reproduction, which are generated due to that high frequency sound bands are suppressed, and reproduction of the audio data comfortable to the human being can be realized.~~

~~According to the present invention, the audio compression and decompression device includes a controller which changes cutoff frequency characteristics of the high frequency component cutting unit, and at least one of the noise components, the frequency band to which the noise components are added, and the volume of the noises, according to a compression bit rate of the adaptive differential pulse code modulation circuit.~~

~~Therefore, it is possible to control the noise components to be added, the frequency band at which the noise components are added, or the volume of the noises in accordance with the compression bit rate, and it is possible to reproduce audio data in a higher sound quality.~~

~~According to the present invention, in the audio compression and decompression device, the high frequency components cutting unit is a low pass filter which includes plural first delay circuits which delay input digital audio data; plural first multipliers which multiply the outputs from the plural first delay circuits by previously set coefficients, respectively; a first adder which adds the input digital audio data and the outputs from the plural first multipliers; a second multiplier which multiplies the output from the first adder by a previously set coefficient; plural second delay circuits which delay output digital audio data; plural third multipliers which multiply the outputs from the plural second delay circuits by previously set coefficients, respectively; a second adder which adds the output from the second multiplier and the outputs from the plural third multipliers; and a fourth multiplier which multiplies the output from the second adder by a previously set coefficient. Therefore, it is possible to more finely control the cutoff frequency characteristics of the LPF.~~

10) Page 14, lines 5-6, please change:

~~According to the present invention, the audio compression and decompression device further includes The audio compression and decompression device of the present invention comprises an adaptive differential pulse code modulation circuit which modulates digital audio~~

data by an adaptive differential pulse code modulation system, a high frequency component cutting unit which cuts off high frequency components existing on a high-frequency band of the digital audio data before compression which are inputted to the adaptive differential pulse code modulation circuit, and an amplitude detection circuit which detects an amplitude in a high frequency region of the digital audio data before compressed which are inputted to the adaptive differential pulse code modulation circuit; and a controller which compares the amplitude detected by the amplitude detection circuit with a threshold value, and changes the cutoff frequency characteristics of the high frequency component cutting unit on the basis of the comparison result. Therefore, it is possible to change the cutoff frequency characteristics of the high frequency component cutting unit, according to the nature of the audio data. Consequently, it is possible to change the cutoff frequency characteristics of the high frequency component cutting unit to those suitable to the audio data, without requiring the user to change the cutoff frequency characteristics of the high frequency component cutting unit, or even for audio data which the user listens to for the first time.

11) Page 16, line 25, please change:

803...~~head-up~~ head amplifier

12) Page 29, line 7, please change:

Hereinafter, the operation of the LPF 500 as shown in figure 5 will be described. Initially, the plural first delay circuits (delay circuits 501a to 501c) at the input side operate to delay the input digital audio data of several samples. Then, plural first multipliers to multiply the respective outputs from the plural first delay circuits by previously set coefficients. That is, a multiplier 502a multiplies the output from the delay circuit 501a by a multiplication coefficient α_1 , a multiplier 502b multiplies the output from the delay circuit 501b by a multiplication coefficient α_2 , and a multiplier 502c multiplies the output from the delay circuit 501c by a multiplication coefficient α_3 . Next, a first adder (adder 503) adds the outputs from the multipliers 502a to 502c and the input digital audio data. Then, a second multiplier (multiplier 504) multiplies the output from the adder 503 by an inverse of a sum of the total of the multiplication coefficients α_1 to α_3 and 1 (i.e., $1/(1+\alpha_1+\alpha_2+\alpha_3)$), as the previously set coefficient.

The coefficient of the multiplier 504 is not needed to be an exact value of $(1/(1+\alpha_1+\alpha_2+\alpha_3))$, and may be a value approximately equal to $(1/(1+\alpha_1+\alpha_2+\alpha_3))$. Next, plural second delay circuits at the output side (delay circuits 508a to 508c) delay the output digital audio data by several samples. Then, plural third multipliers multiply respective outputs from the plural second delay circuits by previously set coefficients. That is, a multiplier 507a multiplies an output from the delay circuit 508a by a multiplication coefficient β_1 , a multiplier 507b multiplies an output from the delay circuit 508b by a multiplication coefficient β_2 , and a multiplier 508e 507c multiplies an output from the delay circuit 508c by a multiplication coefficient β_3 . Then, a second adder (adder 505) adds the outputs from the multipliers 507a to 507c and the output from the multiplier 504. Then, a fourth multiplier (multiplier 506) multiplies an output from the adder 505 by an inverse of a sum of the total of the multiplication coefficients β_1 to β_3 and 1 (i.e., $1/(1+\beta_1+\beta_2+\beta_3)$), as a previously set coefficient. The coefficient of the multiplier 506 is not needed to be an exact value of $(1/(1+\beta_1+\beta_2+\beta_3))$, but may be a value approximately equal to $(1/(1+\beta_1+\beta_2+\beta_3))$. Then, the output from the multiplier 506 is outputted to the outside as digital audio data from which high frequency components on the high-frequency band are removed.